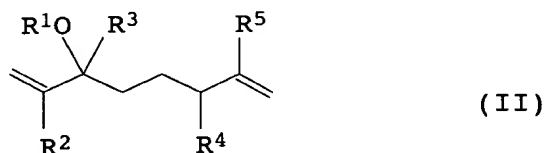
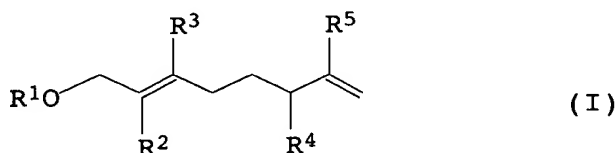


We claim:

1. A process for preparing alkapolyenyl compounds by  
homogeneously catalyzed reaction of 1-substituted  
alka-2,7-dienes of the formula I and/or 3-substituted  
alka-1,7-dienes of the formula II,



where

- R<sup>1</sup> is hydrogen or C<sub>1</sub>-C<sub>6</sub>-alkyl, C<sub>5</sub>-C<sub>8</sub>-cycloalkyl, C<sub>1</sub>-C<sub>6</sub>-alkanoyl, C<sub>6</sub>-C<sub>12</sub>-aryl, C<sub>6</sub>-C<sub>12</sub>-aryloyl or C<sub>7</sub>-C<sub>18</sub>-aralkyl which may each be unsubstituted or monosubstituted, disubstituted or trisubstituted by hydroxy, C<sub>1</sub>-C<sub>6</sub>-alkoxy, C<sub>1</sub>-C<sub>6</sub>-alkanoyloxy and/or halogen, and  
R<sup>2</sup>, R<sup>3</sup>, R<sup>4</sup> and R<sup>5</sup> are, independently of one another, hydrogen or C<sub>1</sub>-C<sub>6</sub>-alkyl,

with 1,3-conjugated dienes of the formula III,

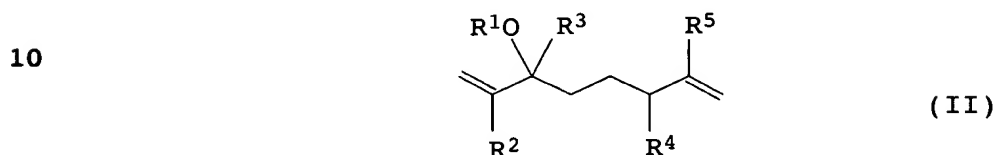
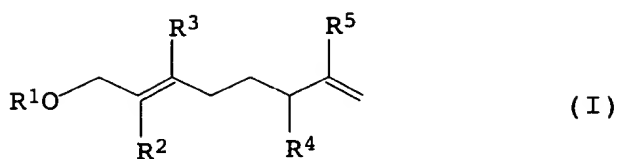


where

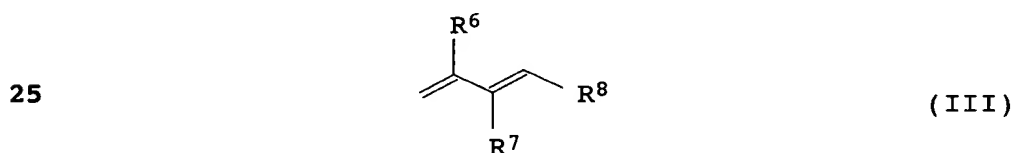
- R<sup>6</sup> and R<sup>7</sup> are, independently of one another, hydrogen or C<sub>1</sub>-C<sub>6</sub>-alkyl, and  
R<sup>8</sup> is hydrogen, C<sub>1</sub>-C<sub>6</sub>-alkyl or C<sub>2</sub>-C<sub>6</sub>-alkenyl,

in the presence of at least one rhodium compound, wherein at least one cocatalyst is dissolved in the reaction mixture which cocatalyst is selected from hydrogen chloride,  $\text{GeCl}_4$  and  $\text{WCl}_6$ .

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2. A process as claimed in claim 1, wherein the reaction mixture consists of two phases, where one phase is liquid and the other phase is gaseous.
- 10 3. A process as claimed in claim 1, wherein the reaction mixture consists of three phases, where two phases are liquid and one phase is gaseous.
- 15 4. A process as claimed in any of the preceding claims, wherein hydrochloric acid is used as cocatalyst.
5. A process as claimed in any of the preceding claims, wherein the amount of cocatalyst is from 5 to  $10^3$  mol per gram atom of rhodium.
- 20 6. A process as claimed in any of the preceding claims, wherein, in addition, hydrogen is added.
7. A process as claimed in any of the preceding claims, wherein, in addition, at least one organic halide is dissolved in the reaction medium.
- 25 8. A process as claimed in any of the preceding claims, wherein  $\text{R}^1$  is  $\text{C}_1$ - $\text{C}_6$ -alkyl, preferably methyl, or phenyl.
- 30 9. A process as claimed in any of the preceding claims, wherein  $\text{R}^2$ ,  $\text{R}^3$ ,  $\text{R}^4$ ,  $\text{R}^5$ ,  $\text{R}^6$ ,  $\text{R}^7$  and  $\text{R}^8$  are hydrogen.
10. A process as claimed in any of the preceding claims, wherein rhodium(III) salts, in particular rhodium trichloride, and/or  $\pi$ -allyl complexes of rhodium, in particular bis( $\pi$ -crotyl)tetrachloro(butadiene)dirhodium, are used.
- 35 11. The use of hydrogen chloride,  $\text{GeCl}_4$  or  $\text{WCl}_6$  as cocatalyst dissolved in the reaction mixture of the homogeneously catalyzed reaction, carried out in the presence of rhodium compounds, of 1-substituted alka-2,7-dienes of the formula I and/or 3-substituted alka-1,7-dienes of the formula II,
- 40
- 45



15 where R<sup>1</sup> is hydrogen or C<sub>1</sub>-C<sub>6</sub>-alkyl, C<sub>5</sub>-C<sub>8</sub>-cycloalkyl, C<sub>1</sub>-C<sub>6</sub>-alkanoyl, C<sub>6</sub>-C<sub>12</sub>-aryloyl or C<sub>7</sub>-C<sub>18</sub>-aralkyl each of which may be unsubstituted or monosubstituted, disubstituted or trisubstituted by hydroxy, C<sub>1</sub>-C<sub>6</sub>-alkoxy, C<sub>1</sub>-C<sub>6</sub>-alkanoyloxy and/or halogen, and R<sup>2</sup>, R<sup>3</sup>, R<sup>4</sup> and R<sup>5</sup> are, independently of one another, hydrogen or C<sub>1</sub>-C<sub>6</sub>-alkyl, with 1,3-conjugated  
20 dienes of the formula III



30 where R<sup>6</sup> and R<sup>7</sup> are, independently of one another, hydrogen or C<sub>1</sub>-C<sub>6</sub>-alkyl, and R<sup>8</sup> is hydrogen, C<sub>1</sub>-C<sub>6</sub>-alkyl or C<sub>2</sub>-C<sub>6</sub>-alkenyl.

12. The use as claimed in claim 11 in a process as claimed in any of claims 1 to 10.

35 13. The use of a mixture obtained by a process as claimed in any of claims 1 to 10 in the preparation of surfactants and detergents.

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